Study Suggests Human Brain Can Create New Nerve Tissue

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fantastically interesting paper," said Dr. Ann Graybiel, professor of neurobiology at the Massachusetts Institute of Technology.

Dr. Emanuel DiCicco-Bloom, assistant professor of neuroscience and cell biology at the Robert Wood Johnson Medical School in Piscataway, N.J., said: "It wasn't thought possible that you would find this in the mature mammalian brain. This work opens a new avenue for the treatment of human brain damage."

Dr. Constance Cepko, a developmental neurobiologist at Harvard Medical School, said: "This is potentially really interesting, but I would like to see if it can be taken to the next step, by activating the same thing in vivo," in the living animal. "If that step is taken, it will be pretty exciting," he said.

Dr. Ronald McKay of M.I.T., who has worked on embryonic nerve cells, said the new technique could someday provide an ethically acceptable alternative to the medical use of fetal brain tissue, experiments that have outraged those who believe such therapies encourage abortions.

"This work suggests we maybe able to obtain material of an embryonic nature from the adult brain," he said. "It could be that the development of pioneering technologies like this will lay the ethical debates to rest." He suggested that if adult human neurons can be made to flourish in the laboratory, the cells could be harvested and transplanted into patients suffering from brain degradation.

Many parts of the body, including the skin, liver, immune system and stomach lining, replenish themselves throughout life, drawing upon their stores of immature cells, called stem cells, to replace tissue lost to normal wear and tear. But the mammalian brain was thought to be largely an exception; extensive tests in monkeys, for example, indicated that beyond the first few days after birth there was no detectable neuronal growth, apart from specialized nerve cells like those in the nose.

Opening a new avenue for the treatment of brain damage.

Drawback to New Neurons

"Continuous neuronal regeneration would not be a good idea for humans," said Dr. Pasko Rakic, a neurobiologist at Yale University School of Medicine. "We store information in our neurons, and if you changed neurons every year, you'd have to go to college every year to relearn English."

Dr. Weiss and Dr. Reynolds were inspired to consider the possible plasticity of the adult brain by their studies of mouse embryos. In those experiments, they cultivated fetal cells believed to be the precursors to brain tissue and fed them a serum of epidermal growth factor, a blood protein that normally helps in healing wounds.

They expected the growth factor to merely keep the cells alive, but it proved to have a more dramatic effect: the cells began to grow. More startling still, when the cells became crowded enough in the confines of their lab dish, they stopped dividing and instead matured into two cell types: glial cells, which form the protective and nourishing connective tissue of the brain, and cells that looked like neurons, the central processing units of the brain.

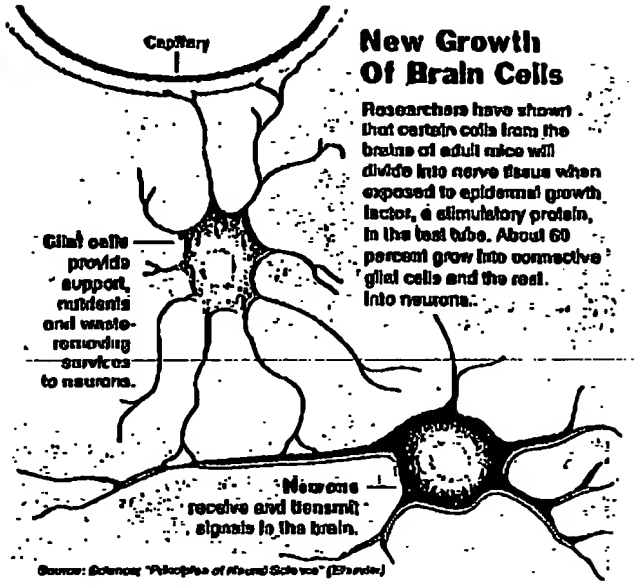
Taking a gamble, the researchers decided to search for similar neuronal stem cells in adult mice. They isolated cells from the striatum, a region deep in the brain where, it turns out, considerable degradation occurs in patients with Huntington's disease. Some of the cells they pulled out had characteristics indicating that they were indeed a lingering group of embryonic cells. On their surface was a protein called nestin, until then thought to exist only in fetal brains.

15 of 1,000 Cells Responded

When the adult stem cells were placed in a dish, a vast majority quickly died. But about 15 of 1,000 cells responded to the fencing effects of epidermal growth factor. They proliferated into sizable populations and within about two to three weeks began maturing, with 60 percent growing into connective glial cells and 40 percent assuming the distinctive character of neurons. These cells had the shape and wispy processes of neurons, and also produced two neurotransmitters, the molecules nerve cells use to communicate with one another.

Scientists have no clue to what the stem cells normally do in the striatum, but they clearly do not repair the brain in the wake of damage and degeneration. Nevertheless, Dr. Weiss suggested that the cells could be amenable to manipulation with drugs, perhaps a synthesized version of epidermal growth factor or similar stimulatory protein. In theory, the factor would cause the normally dormant cells to proliferate into a emergency population to replace dead or dying neurons.

"Just because the brain doesn't repair itself normally doesn't mean it can't repair itself," he said, although he cautioned that at this point he was merely allowing his imagination to soar.



New Growth Of Brain Cells

Researchers have shown that certain cells from the brains of adult mice will divide into nerve tissue when exposed to epidermal growth factor, a stimulatory protein, in the test tube. About 60 percent grow into connective glial cells and the rest into neurons.

The New York Times; Researched by C. B. Williams

New Nerve Tissue Generated From the Brain Cells of Mice

By NATALIE ANGIER

The adult mammalian brain, long thought to be incapable of repairing itself, possesses a pool of immature cells that can be coaxed to divide into new nerve tissue, scientists have found.

The discovery is the first compelling evidence that the adult brain retains the potential to generate fresh nerve cells, a talent ordinarily limited to the embryo. Although the result is extremely preliminary and is still limited to experiments on mice, many scientists said it had broad implications for the treatment of neurodegenerative diseases like Alzheimer's, Parkinson's and Huntington's, as well as spinal cord injuries.

Studying the brains of grown mice, Dr. Samuel Weiss and Dr. Brent A. Reynolds of the University of Calgary Faculty of Medicine in Alberta, Canada, discovered a hidden reservoir of cells that when placed in a test tube and treated with a powerful stimulatory protein called epidermal growth factor would bloom into neurons, with long willowy tendrils, telltale signaling molecules and other hallmarks of nerve cells.

'Left Us Speechless'

But researchers warned that much work remained to demonstrate the full significance of the result. For one thing, biologists must determine that human brains harbor a similar population of progenitor cells.

For another, the tests were done by isolating the rodent cells and treating them in laboratory dishes, and researchers are now seeking to learn whether the factory protein can prompt the same sort of neural regrowth in living mice.

The finding, nevertheless, was a complete surprise to the researchers, as it challenges traditional notions that nearly all mammalian nerve cell growth ends shortly after birth.

"It left us speechless," Dr. Weiss said. "We were scratching our heads and trying to explain this to ourselves, before we decided to explain it to the rest of the world." The new report appears today in the journal Science.

Other neurobiologists were quick to praise the new work. "I think it's a

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APPENDIX B